Élan™ Am386®SC300 Silicon Engine Evaluation Board Reference Manual

Warning : Important Information. Read before using Evaluation Board.

Note: Before applying power, the following precautions should be taken to avoid damage or misuse of board :

* Make sure power supply connectors are plugged onto board correctly. The grounds (usually black wires) should meet at the center of the two power supply connectors on the board.

* See page 8 for important information regarding evaluation board restrictions.

* See appendix B for a list of peripherals that have been used to test the evaluation board prior to shipping.

The following documents are updated on an ongoing basis & contain important errata information regarding the Evaluation board :

* Refer to Evaluation Board Errata document for H/W issues pertaining to the evaluation board. This document is available through your FAE.

* Refer to BIOS Errata document for S/W issues pertaining to the Phoenix BIOS that is shipped with your evaluation board. This document is available through your FAE.

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Introduction

Congratulations on your decision to design with the Élan Am386SC300 Silicon Engine! This sophisticated, integrated device is uniquely suited to meet the needs of the next generation of handheld devices. From its high integration to PC/AT compatibility to remarkable power management, the Am386SC300 Silicon Engine is the ideal device to enable compact, fully functional, battery powered designs with a quick time to market.

The Élan Am386SC300 Silicon Engine Evaluation Board has been provided as a development platform for Élan Am386SC300 Silicon Engine based designs. Most of the possible options and features of the Élan Am386SC300 Silicon Engine can be exercised on this board. Since there are numerous options available, this board is a much larger form factor that could be achieved with a dedicated set of features. Refer to the Internal Video Reference Design Schematics and Local Bus Reference Design Schematics for more realistic system design reference examples. This board is provided as a reference only. It should be used to experiment with the design tradeoffs of the Élan Am386SC300 Silicon Engine, make power measurements, and develop firmware.

Advanced Micro Devices does not assume any responsibility for the maintenance of this evaluation tool. Changes to the schematics will only be updated in the event that the board is required to go back through a CAD layout process.

Refer to the reference design schematics for updated information on any system design issues.

Refer to the Am386SC300 Data Sheet and Programmer's Reference Manual for detailed information on the Am386SC300 Silicon Engine functionality.

Élan Am386SC300 Silicon Engine Evaluation Board Features

Purpose: Provide a test and development platform for engineers using the Élan Am386SC300 Silicon Engine.

Features:

- Large form factor board (12" x 12")

- Runs at 25 MHz w/ 5V or 3.3V DRAM

- Included on the board
  - ⇒ Élan Am386SC300 Silicon Engine with integrated
    - ♦ AT Logic
    - ♦ DRAM Controller
    - ♦ 450 UART
    - ♦ EPP Parallel Port
    - ♦ Power Management Unit
    - ♦ PCMCIA 2.0 controller
    - ♦ LCD Controller
  - ⇒ Super I/O utilizing extra UART and floppy disk controller
  - ⇒ 2 MB DRAM (5V)
  - ⇒ 8042 keyboard controller for keyboard and PS/2 mouse
  - ⇒ Phoenix BIOS
  - ⇒ IDE connector
  - ⇒ 2 ISA slots
  - ⇒ Proprietary local bus connector
  - ⇒ Serial and parallel ports
  - ⇒ LCD connector
  - ⇒ CRT connector

- Provides three main memory configuration options
  1) 4 standard 30 pin SIMM sockets
     - ♦ Up to 16M
     - ♦ 4 or 8 bit DRAM
       - * 1M - 2x 512K, 1 bank
       - * 2M - 2x 1M, 1 bank
       - * 4M - 4x 1M, 2 banks
       - * 8M - 2x 4M, 1 bank
       - * 16M - 4x 4M, 2 banks
  2) 72 pin SIMM socket for 16 bit SIMM module from Micron
  3) 4 SRAM sockets
     - ♦ 128K x 8 for 512K
     - ♦ 512K x 8 for 2M

- Allows testing of all three Élan Am386SC300 Silicon Engine bus options
  1) Internal Video
  2) ISA
  3) Local Bus

- Several power planes and capabilities to measure current consumption

- All CPU voltage sources: V_{cc}, V_{ccmem}, V_{ccsys}, V_{ccsys2}, $V_{cc5,}$ V_{cc1}, A_{vcc}
- 3V or 5V DRAM

- System hardware integration features
  - 2 ISA slots
  - Breadboard area
  - Local bus connector

- System software development environment
  - Sockets for BIOS and Application ROM images
  - Supports DOS soft ICE tools and ROM ICE tools

- Headers for all 208 signals on the Élan Am386SC300 device

- Suspend/Resume button

- MicroPower mode testing

- DIP switch for transitioning battery low pins

- Negative contrast voltage and control signals for LCD

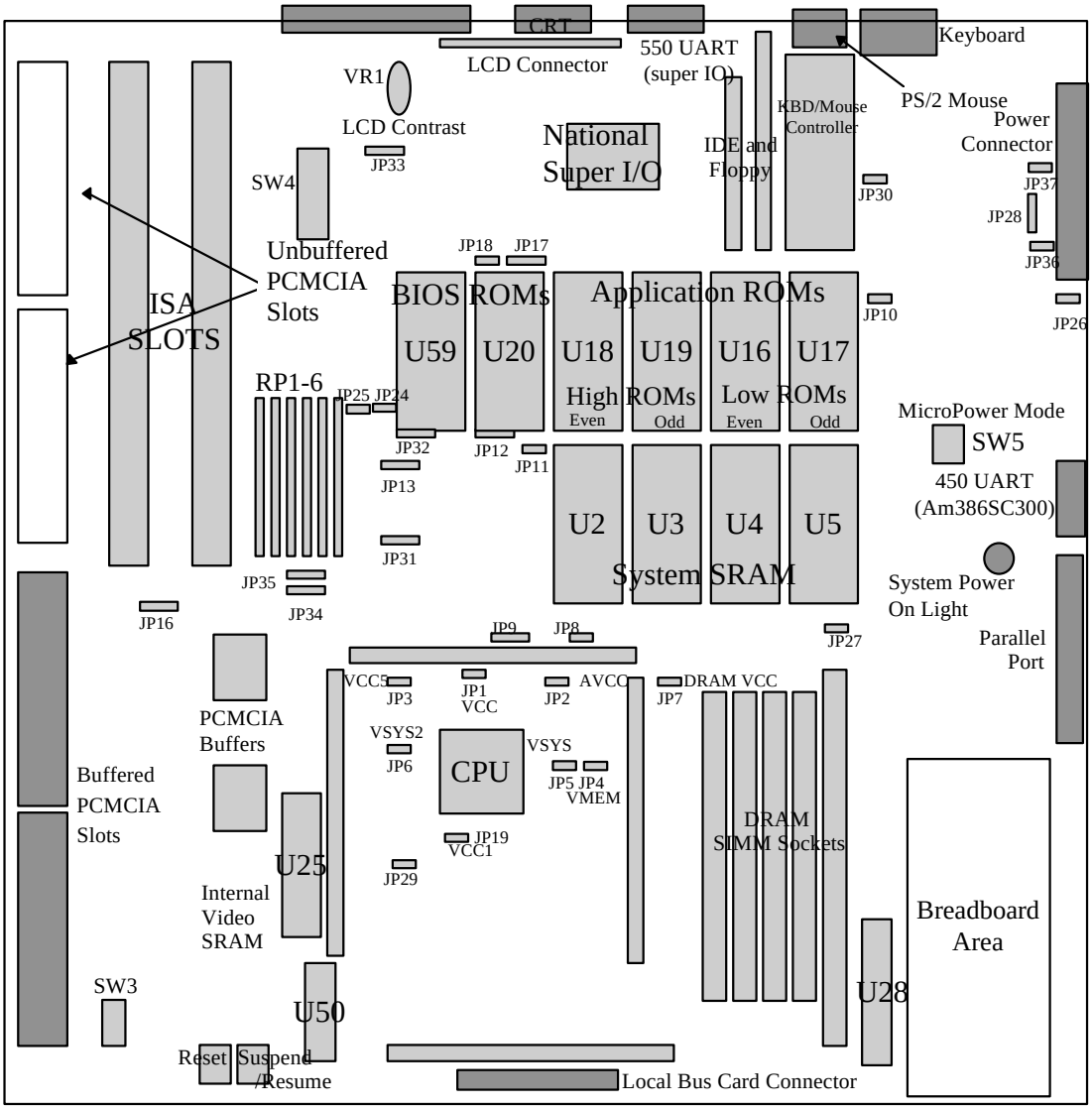
- 12V V_{PP} Flash ROM's and PCMCIA programming voltages

- Supports 128K or 256K BIOS

- Supports 2M ROM
  - DOS
  - Geoworks

- 2 Buffered PCMCIA sockets/2 Unbuffered PCMCIA sockets
  - Jumper option to choose between buffered & non-buffered sockets

Élan Am386SC300 Silicon Engine Evaluation Board



Evaluation Board Restrictions

- This revision 2.2 of the Evaluation Board is not backwards compatible with the Rev. A Am386SC300 Silicon Engine.

- The evaluation board ISA bus can only run at 5 volts. In normal designs this is not a restriction.

- The Élan Am386SC300 Silicon Engine integrates two PCMCIA type II controllers. The evaluation board muxes these two controllers to four physical connectors (two hot swap slots, two minimum buffered slots) to demonstrate the ability to support hot swap or low cost PCMCIA solutions. The user has the option of using either the Buffered or the Non-Buffered sockets but not both at the same time.

- Local bus and internal CGA implementations require that the system DRAM be 3.3 volts. This is due to some of the local bus signals being referenced to V_{CC} which is always 3.3 volts.

- The DRAM SIMM modules must have a 70ns RAS access time or less.

- The DRAM on the SIMM modules must be x4, x8 or x16. The Am386SC300 Silicon Engine can not drive x1 DRAM due to the large capacitance associated with 32 loads.

- System DRAM and system SRAM can not be supported simultaneously.

- System DRAM population of both the 30 pin SIMM sockets and the 72 pin SIMM socket is not supported simultaneously.

- The 72 pin SIMM socket will only work with 16 bit SIMM modules.

- Software can not be used to switch between ISA, CGA, and local bus configurations. One of the configurations must be set-up before power up.

- The BIOS ROM socket (U20) can only be populated with:
  - 128K x 8 ROM
  - 128K x 8 Flash
  - 256K x 8 Flash

- The DOS ROM sockets (U16-U19) can only be populated with:
  - 256K x 8 ROM
  - 512K x 8 ROM
  - 256K x 8 Flash

- Some ISA signals are not available when using Internal CGA or Local bus modes. Refer to the Hardware Data Sheet and Programmer's Reference Manual for detailed information of the Am386SC300 Silicon Engine functionality.

- The RTC RAM (integrated in the Am386SC300 Silicon Engine) which is used to maintain time, date & system configuration data is cleared (lost) when power is removed from the V_{CC} & AV_{CC} power planes.

MicroPower Off Mode

A new feature of the Rev. B Am386SC300 Silicon Engine is MicroPower Off Mode. This mode is the lowest power mode for the Am386SC300 Silicon Engine. When the system is initially powered by turning on the power supply and then pressing the MicroPower button, SW5, the system will enter Full Speed Mode. The red power light indicates that the system is fully powered on. Pressing the MicroPower button, SW5, again, will cause Élan to enter MicroPower Off Mode. During MicroPower Off Mode, only AV_{CC}, V_{CC}, and the 32KHz crystal remain active. The system is essentially off, but the RTC remains in operation. Please refer to the Élan Am386SC300 Data Sheet for a more detailed explanation of this feature.

Memory

The Élan Am386SC300 Silicon Engine Evaluation Board supports up to 16 MB of memory in three different formats: 72 pin 16 bit SIMM, 30 pin 4 or 8 bit SIMMs, or 128K or 256K x 8 SRAMs. Only one of these options can be used at a time. Refer to the following jumpers for memory configuration.

DRAM Main Memory

The Élan Am386SC300 Silicon Engine Evaluation Board comes standard with 2M of standard 30 pin 70ns DRAM SIMMs installed on the board. The evaluation board requires DRAMs with access times of 70ns or less. The DRAM memory can be upgraded using 4 or 8 bit 30 pin SIMMs; 1 bit SIMMs can not be used on the evaluation board due to loading restrictions associated with the 32 loads:

Total Memory	Bank 0	Bank 1
1M	2 512K	empty
2M	2 1M	empty
4M	2 1M	2 1M
8M	2 4M	empty
16M	2 4M	2 4M

16M of main DRAM memory can also be installed using a 72 pin 16 bit SIMM module. This can be installed in the 72 pin SIMM socket located next to main memory bank 1 on the evaluation board.

SRAM Main Memory

When using SRAM for system memory, populate slots U2-U5 with 128K x 8 or 256K x 8 SRAMs for a total of 512K or 2M total system memory.

JP9 Setting	**System SRAM Size**
1-2	128K x 8
2-3	256K x 8

Memory Voltage Setting

The Élan Am386SC300 Silicon Evaluation Board allows system memory to operate at either 5V or 3.3V. When operating in Local Bus Mode, 3.3V memory must be used. In order to operate memory at 3.3V, ensure that the memory is rated for 3.3V operation. SW4-1 controls the voltage for the system memory.

SW4-1 Setting	**Memory V_{CC}**
OFF	3.3V
ON	5V

Bus Options

The Élan Am386SC300 Silicon Engine allows designs to utilize three different bus options: ISA, Internal Video, or Local Bus. While in ISA mode, most of the ISA bus signals are available (refer to the Am386SC300 Data Sheet for a detailed description of the ISA bus). When in Internal Video Mode, LCD and CGA control signals are available from the Am386SC300 device as well as a limited subset of the ISA bus signals. Local bus mode provides a 386 local bus in addition to a subset of ISA bus signals. Refer to the Élan Am386SC300 Device Data Sheet for a description of the signals available in each of these modes.

The Élan Am386SC300 Silicon Engine Evaluation Board allows testing in each of the three bus modes available from the Am386SC300 device. Bus mode selection must be made before applying power to the board and cannot be changed while the board is in operation. Selection of the bus mode is determined by the resistor packs labeled RP1-RP6:

Bus Mode	RP1	RP2	RP3	RP4	RP5	RP6
ISA	installed	installed	empty	empty	empty	empty
Internal Video	empty	empty	installed	installed	empty	empty
Local Bus	empty	empty	empty	empty	installed	installed

When adjusting the Bus Mode jumpers, be sure to follow pin 1 designations. Pin one on the resistor packs must correspond to pin one on the evaluation board. JP16-18 must be set based on what bus mode is selected.

Bus Mode	JP16		JP17		JP18
	1-2	2-3	1-2	2-3	
Full ISA Mode	n/a	n/a	enables 550 UART	disables 550 UART	Connects 8042 IRQ12 to Am386SC300 IRQ12
Internal CGA Mode	LCD display	CRT display	enables 550 UART	enables PS/2 mouse	Must be open IRQ12 becomes FRM (VSYNC) signal.
Local Bus Mode	2X CPU clock	1X CPU clock	enables 550 UART	disables 550 UART	Connects 8042 IRQ12 to Am386SC300 IRQ12

ISA Mode

Provided on the Élan Am386SC300 Evaluation Board are two physical 16 bit ISA bus connectors. These slots are available for use when the board is configured for ISA Mode. The Am386SC300 Silicon Engine ISA bus is a subset of a full ISA bus. Some signals are not be available, therefore some ISA cards may not function properly on the evaluation board (refer to the Am386SC300 Data Sheet for a detailed description of the ISA bus). The ISA bus is wait state programmable (refer to the Am386SC300 Programmers Reference Manual for details on programming ISA bus timings).

Local Bus Mode

The Élan Am386SC300 Silicon Engine Evaluation Board provides a proprietary local bus connector for testing of local bus designs. Since this connector is not standard, a custom interface will be required to test the local bus functionality of the Am386SC300 device on the evaluation board. In Local Bus Mode, some of the ISA bus signals will be lost. Refer to the Am386SC300 Silicon Engine Data Sheet for more details on what signals are available in this mode. Since different local bus implementations require different signal connections, signals VGA_{RDY0}, VL_{RDYI}, and VGA_{RDY} are connectable through switches 2 and 3 on SW3:

SW3-2	Affected Signals
ON	Connects VGA_{RDY} to VL_{RDYI}
OFF	open

SW3-3	Affected Signals

ON	Connects VL_{RDY0} to VL_{RDYI}
OFF	open

note: VL_{RDYI} corresponds to L_{RDY0} on the Am386SC300 device and VL_{RDY0} corresponds to CPU_{RDY} on the Am386SC300 device.

Internal Video Mode

The Élan Am386SC300 Evaluation board allows the testing of the internal video controller on the Am386SC300 device. When this mode is selected, the CRT port or the LCD connector on the evaluation board are enabled. Use JP16 to select between CRT or LCD modes:

JP16 Setting	Internal Video Mode
1-2	LCD
2-3	CRT

JP18 must be left open in Internal Video Mode. This jumper connects IRQ12 from the 8042 to pin 181 on the Am386SC300 device which is the FRM signal in this mode. Refer to the IO section for a detailed description of this jumper.

Bus Mode	JP18
Internal Video	must be open
ISA/Local Bus	closed to enable PS/2 port

Provided on the evaluation board is an easily customized connector for LCD operation. A specific panel header is not included due to the lack of an industry standard LCD interface. All of the necessary LCD signals are provided through this connector. 3.3V and 5V power planes are provided as well as an adjustable negative 17V contrast voltage at VR1. Refer to the evaluation board schematics for a description of the LCD interface on the evaluation board.

If CRT mode is selected, the CGA port on the evaluation board will be enabled. A CGA compatible CRT can be connected to this standard 9 pin CGA port.

ROMs

The Élan Am386SC300 Silicon Engine Evaluation Board provides two BIOS ROM sockets and four application ROM sockets capable of handling up to 256K of BIOS ROM and 2M of application ROM. The evaluation board supports BIOS and application ROMs as either Flash or EPROM devices. JP12 must be set to select either Flash or EPROM devices.

JP12	Type of ROM
1-2	Flash
2-3	EPROM

Two BIOS ROM sockets, U59 and U20, are available on the evaluation board. Each BIOS ROM socket is capable of supporting a 128K or 256K Flash or EPROM BIOS ROMs. The active BIOS ROM is selectable by JP32.

JP32	BIOS ROM Selection

1-2	U59
2-3	U20

Four 8 bit application ROM sockets, U16 - U19, are provided on the evaluation for ROM based applications such as ROM DOS. U16 (Even) and U17 (Odd) make up one logical 16 bit ROM (Low) beginning at offset 0 in application ROM space. U18 (Even) and U19 (Odd) make up a second logical 16 bit ROM (High) beginning where U16 and U17 end in application ROM space. These sockets can be populated with either 256K or 512K 8 bit devices. JP13 selects the size of application ROMs which can be used.

JP13	Application ROM Size
1-2	256K x 8
2-3	512K x 8

Power Management

The Am386SC300 Silicon Engine offers unparalleled power management in its class. In addition to low operating current, five power management modes are available: Full Speed, Low Speed, Doze, Sleep, Suspend, Off. Refer to the Élan Am386SC300 Silicon Engine Data Sheet for an in-depth discussion of these modes.

Suspend/Resume

The Am386SC300 Silicon Engine Evaluation Board provides a hardware option to allow the user to toggle between Full On and Suspend. By pressing the Suspend/Resume button while the system after the system has powered up, the system will enter the Suspend mode. By pressing the Suspend/Resume button again, the system will return to Full Speed Mode.

Power Management Simulation

Battery backup conditions can be simulated on the evaluation board by controlling the AC_{IN} signal to the Am386SC300 Silicon Engine. When AC_{IN} is low, power management functions on the Am386SC300 device are enabled. When AC_{IN} is high, power management functions on the Am386SC300 device are disabled. Switch 8 on SW4 controls the AC_{IN} pin on the Am386SC300 Silicon Engine, allowing power management functions to take effect if they are enabled.

SW4-8	AC_{IN}
ON	GND
OFF	5V

In order to get true power measurements while in Suspend Mode, IRQ1 and PIRQ1 must be disconnected from the Am386SC300 device. The Am386SC300 device will drive these signals low during Suspend Mode. Since the peripherals connected to these lines drive them high, this will create the appearance of additional power drain. These signals can be easily disconnected while in Suspend Mode using switches 2 and 3 on SW4.

SW4-2	PIRQ1
ON	connect
OFF	disconnect
SW4-3	**IRQ1**
ON	connect
OFF	disconnect

Before exiting from Suspend Mode, IRQ1 and PIRQ1 must be reconnected for the system to function properly.

PCMCIA

The Élan Am386SC300 Evaluation Board provides two buffered and two unbuffered PCMCIA slots controlled by the PCMCIA controllers on the Am386SC300 device. The signals to the buffered and unbuffered slots have been muxed together to allow testing of either a buffered PCMCIA or unbuffered PCMCIA solution. All four slots cannot be used simultaneously. The selection of PCMCIA slots is controlled by JP34 and JP35.

JP34 Setting	PCMCIA Socket A Selection
1-2	unbuffered
2-3	buffered

JP35 Setting	PCMCIA Socket B Selection
1-2	unbuffered
2-3	buffered

The two buffered PCMCIA slots allow hot-swapping of PCMCIA cards while the system is in operation, demonstrating a high end PCMCIA solution based on the Am386SC300 device. These slots are buffered from the system by two CHIPS F87000 PCMCIA buffers.

The two unbuffered PCMCIA slots demonstrate the functionality of a non-buffered, low cost PCMCIA implementation using the Am386SC300 Silicon Engine. Since there is no buffering, hot-swapping is not supported by these slots.

IO

The Élan Am386SC300 device integrates several standard IO interfaces. A 450 UART, bi-directional parallel port, and an IDE hard drive interface are controlled by the Am386SC300 device. In addition, the Élan Am386SC300 Silicon Engine Evaluation Board contains a super IO which controls a 550 UART and floppy disk drive. In order to provide a generic Am386SC300 device BIOS, the parallel port and serial ports are not enabled by BIOS (see utilities disk for enabling code).

A standard 9 pin connector is provided for an extended PC keyboard. A PS/2 port is provided for use with a PS/2 style mouse. Both the keyboard and PS/2 mouse are driven by the 8042 running Phoenix Multikey keyboard controller firmware.

PS/2 Mouse

A PS/2 port has been provided on the evaluation board for a PS/2 style mouse. This device is driven by the 8042 keyboard controller. While in ISA or Local Bus Mode, the Am386SC300 device IRQ12 signal is connected to the IRQ12 signal on the 8042 to control the PS/2 mouse. In Internal Video Mode, the Am386SC300 device IRQ12 signal becomes FRM, and therefore is not available to the 8042. In order to use the PS/2 mouse in Internal Video Mode, PIRQ0 from the Am386SC300 device (which is normally used for the super IO serial port) must be redirected to the 8042 IRQ12 signal. By redirecting this signal, the serial port on the super IO will be disabled. While in internal video mode, the super IO serial port and the PS/2 mouse port can not be used simultaneously. Set JP17 and JP18 using the following settings:

Bus Mode	JP17		JP18
	1-2	2-3	
Full ISA Mode	enables super IO serial port	do not use	Closed to enable PS/2 mouse
Internal CGA Mode	enables super IO serial port	enables PS/2 mouse	must be open
Local Bus Mode	enables super IO serial port	do not use	Closed to enable PS/2 mouse

Power Measurement

The evaluation board allows for measurement of current flow in separate V_{CC} planes for power budget analysis. The following table summarizes the connections to the V_{CC} jumpers. **Be sure to turn off system power before removing JP1-11. Replace JP1-11 before power up or the system will not work.**

Jumper	V_{CC}	Logic connected to V_{CC} plane
JP1	V_{CC}	Am386SC300 device core V_{CC} only. Always 3.3V
JP2	V_{CC3}	Am386SC300 device AV_{CC} pin. Analog V_{CC}. Always 3.3V
JP3	V_{CC5}	Am386SC300 device V_{CC5} pin. Diode clamp refs except V_{CCMEM} source pins. Always 5V except in full 3.3V designs. (Evaluation board limits to 5V)
JP4	V_{CCMEM}	Am386SC300 device memory interface V_{CC}. See SW4 table for 3.3V or 5V setting. Restrictions do apply. Also the diode clamp ref for pins attached to this V_{CCMEM} pin.
JP5	V_{CCSYS}	Am386SC300 device ISA bus V_{CC} and other misc pins. 5V or 3.3V. Refer to datasheet for details.
JP6	V_{CCSYS2}	Am386SC300 device alternate pin V_{CC}. 5V or 3.3V. Refer to datasheet for details.
JP7	$V_{CCMEM53}$	System DRAM V_{CC} plane.
JP8	V_{CCSRAM}	System SRAM V_{CC} plane.
JP10	V_{CCKBOS}	8042 V_{CC}
JP11	V_{CCROM}	BIOS and Application ROM V_{CC}
JP19	V_{CC1}	Am386SC300 V_{CC1} pin 176. 5V or 3.3V

BL1-4 Pins

These signals are used to indicate to the Am386SC300 Silicon Engine the current status of the battery. A high signal indicates normal operating conditions, while a low indicates a warning condition. Access to these signals has been provided on the evaluation board to allow designers to test their functionality. Switches 4-7 on SW4 allow the BL1-4 signals to be toggles between GND (warning) and 5V (normal).

SW4	Signal	ON	OFF
4	BL1#	GND	5V
5	BL2#	GND	5V
6	BL3#	GND	5V
7	BL4#	GND	5V

Breadboard Area

A breadboard area has been provided on the Élan Am386SC300 Silicon Engine Evaluation Board. This area can be used as a convenient place to build custom circuits to interface to the evaluation board. The pins in this breadboard are all isolated from other pins and the rest of the board.

BIOS

The Élan Am386SC300 Silicon Engine Evaluation Board comes with PhoenixPICO BIOS support for the Élan Am386SC300 Silicon Engine. This is a BIOS written specifically for the Am386SC300 Silicon Engine Evaluation Board. The evaluation board BIOS is upgraded on an ongoing basis. Refer to BIOS errata document for errata information on specific BIOS releases.

When the system powers up, the BIOS will test the system and determine if there are any problems with the setup configuration. Since there is no CMOS backup power on the evaluation board, it will use the default BIOS settings upon initial power up. The system will prompt the user to press F2 to enter the setup screen. Press CTRL-ALT-S to enter the BIOS setup screen during bootup or from a DOS prompt.

Main Menu Options

Once in the setup screen, the following keys are used for manipulations:

Key	Function
Up Arrow	Move cursor up
Down Arrow	Move cursor down
Left Arrow	Move cursor left
Right Arrow	Move cursor right
+ or -	Toggle through options
Page Up or Page Down	Switch setup screen pages

System Time: Hour, Minute, and Second

System Date: Month, Date, and Year

Diskette A and Diskette B: These are the floppy disk drives. The system will attempt to boot from Diskette A at start up; if nothing is found there, it will continue to attempt booting from Hard Drive 1.
(default = Not Installed; options = Not Installed/PCMCIA/3.5",1.44MB/3.5",720KB/5.25",1.2MB/5.25",360KB)

Hard Disk 1 and Hard Disk 2: Hard Disk 1 is the default boot up drive. The system will first check Diskette A; if nothing is found there, it will attempt to boot from Hard Disk 1. (default = Not Installed; options = Not Installed/type 1-49)
If user type 48 is chosen, the following parameters must be set:

Type	Number designation for the drive (user type = 48)
Cyl	Number of cylinders on specified drive
Hd	Number of heads on specified drive
Pre	Designates the starting cylinder of the read delay circuitry
LZ	Designates the cylinder location where heads will normally park when system is down
Sec	Number of sectors per track

Base Memory: This is the amount of base memory installed on the system. It is automatically detected, so it should not require any manipulation

Extended Memory: This is the amount of extended memory installed on the system. It is automatically detected, so it should not require any manipulation.

NumLock on at Boot: This determines whether NumLock will be set when the system boots up.
(default = YES; options = YES/NO)

Power Management: This determines whether power management options are active when the system boots up.
(default = Enabled; options = Enabled/Disabled)

Full Speed: This is the full on system speed. (default = 25MHz; options = 25MHz/20MHz/09MHz/33MHz)

Idle Speed: This selects the idle speed of the system (default = Slow; options = Slow/Fast)

Low Speed: This is the low speed for the system. (default = 0.5MHz; options = 0.5MHz/4.6MHz/2.3MHz/1.0MHz)

Idle Speed Timeout: This is the amount of time before the system switches from idle speed to low speed.
(default = 1 minute; options = 1 minute/32 seconds/16 seconds/8 seconds/4 seconds/2 seconds/1 second/.5 seconds)

Low Speed Timeout: This is the amount of time before the system switches from low speed to doze.
(default = 1 minute/32 seconds/16 minutes/10 minutes/5 minutes/4 minutes/3 minutes/2 minutes)

Utilities Disk

Included with this Élan Am386SC300 Silicon Engine Evaluation Board Kit is a utilities disk. This disk contains several utilities developed specifically for the evaluation board to assist the user in their evaluation and design with the Am386SC300 Silicon Engine. Some of these utilities may work on other Élan based platforms, but there functionality outside of the Rev. 2.2 evaluation board can not be guaranteed and therefore will not be supported. The following utilities are included on the Utilities Disk:

- REGDUMP.EXE (register view and edit utility)
- BASICPCM.EXE (Phoenix PCM+ PCMCIA Software for the Élan Am386SC300 Silicon Engine)
- PCMMAN.EXE (Phoenix PCM+ manual)
- MMSVIEW.EXE (MMS view and edit utility)
- EVALSET.EXE (serial and parallel port enabling utility)
- ADAP.DOC (Phoenix PicoBIOS Adaptation Guide)
- RELEASE.TXT (Release notes for Phoenix PicoBIOS for Élan, Rev. 1.14)

REGDUMP.EXE

This register dump utility has been provided for use on the Élan Am386SC300 Silicon Engine Evaluation Board. It is intended to provide a user with a easy to use register manipulation program. This program will display the index register in the Am386SC300 device, grouped by functionality. For complete operating instructions on REGDUMP.EXE, refer to appendix C.

BASICPCM.EXE

Included on the Utilities Disk is a self extracting pkzip file containing a directory of binary images from the special port of generic PCM+ 3.10 to the Élan Am386SC300 Silicon Engine. This port is in a beta stage, so complete, robust functionality can not be guaranteed. This software has been included to allow designers to observe the functionality of the PCMCIA controllers on the Am386SC300 device. Included in this directory are:

README.TXT	File list of PCMCIA directory
RELEASE.TXT	PLEASE READ: Contains important notes on this release
CONFIG.SYS	Sample for configuring PCM Plus
CNFIGNAM.EXE	Multiple configuration manager
PCMSSIT.EXE	Socket Services for Élan
PCM.EXE	PCM Information and Configuration program for DOS
PCMCS.EXE	Card Services for Élan
PCMCSFUL.EXE	Card Services for Élan with support for flash memory
PCMFDISK.EXE	ATA disk partitioning utility
PCMFFCS.EXE	High-level bridge between card services and MS-FLASH
PCMMTD.EXE	Memory Technology Driver for flash support
PCMRMAN.EXE	Resource Manager Utility
PCMSCD.EXE	Super Client Driver for all non-ATA cards
PCM.INI	Configuration file with support for multiple configurations
PCMATA.EXE	ATA Card Utility
PCMATA.SYS	ATA Card Driver
PCMRMAN.SYS	Resource Manager Driver

MS-FLASH.SYS Microsoft Corp. Flash File System Driver

The zipped file that contains the PCM+ software is titled BASICPCM.EXE. To expand this directory use the following procedure:

1. Copy BASICPCM.EXE into a dedicated directory on the hard drive or floppy drive.
2. Execute BASICPCM.EXE in its dedicated directory.
3. BASICPCM.EXE will expand to the files listed above.
4. Refer to the README.TXT for a list of files, and refer to CONFIG.SYS for a sample setup file.

PCMMAN.EXE

The PCM+ users manual, PCMMAN.EXE, has been included for reference while using the PCMCIA software. To utilize this manual, move PCMMAN.EXE to the desired directory. When PCMMAN.EXE is executed, it will unzip the file in the directory from which it was executed.

MMSVIEW.EXE

MMSVIEW is a DOS application that may be used to inspect various resources that are accessible by the Élan MMS subsystem. These resources include *SYSTEM RAM*, the *BIOS ROM* (or resources accessed by ROMCS# signal), the *DOS ROM* (or resources accessed by the DOSCS# signal), or the *PCMCIA* slots. For complete operating instructions on MMSVIEW.EXE, refer to appendix D.

EVALSET.EXE

EVALSET.EXE has been provided to allow easy activation of the serial and parallel ports on the Élan Am386SC300 Silicon Engine Evaluation Board. The BIOS on this board was designed to be generic, therefore these functions are not enabled by the BIOS on the evaluation board. This utility can be used to set up the base addresses for serial port 1, serial port 2 and parallel port 1 on the evaluation board. For complete operating instructions on EVALSET.EXE, refer to Appendix E.

Appendix A: Evaluation Board Setup Summary

Bus Mode Selection and Affected Jumpers

Bus Mode	Resistor Pack Setting	JP16		JP17		JP18
		1-2	2-3	1-2	2-3	
Full ISA Mode	Install RP1 & RP2 only	n/a	n/a	enables 550 UART	disables 550 UART	Connects 8042 IRQ12 to Am386SC300 IRQ12
Internal CGA Mode	Install RP3 & RP4 only	LCD display	CRT display	enables 550 UART	enables PS/2 mouse	must be open
Local Bus Mode	Install RP5 & RP6 only	2X CPU clock	1X CPU clock	enables 550 UART	disables 550 UART	Connects 8042 IRQ12 to Am386SC300 IRQ12

Configuration Jumpers

3 Position Jumpers	System Affected	1-2	2-3
JP9	System SRAM	Selects 128K x 8	Selects 512K x 8
JP12	DOS ROM & BIOS	Selects Flash	Selects EPROM Device
JP13	DOS sockets	256K x 8	512K x 8
JP16			
Local Bus Mode	CPU clock	2X	1X
Internal Video Mode	Display device	LCD	CRT
JP17	Super IO Serial Port PS/2 Mouse	Enables Super I/O serial port	Enables PS/2 mouse in Internal Video Mode*
JP32	Selects BIOS ROM socket	U59	U20
JP34	Enable the unbuffered or buffered socket A	Enable unbuffered socket A	Enable buffered socket A
JP35	Enable the unbuffered or buffered socket B	Enable unbuffered socket B	Enable buffered socket B

*can not be set in ISA or Local Bus Mode; JP18 must be disabled in Internal Video Mode

JP18 (takes on different functions depending on the bus mode selected)

ISA or Local Bus	Enables PS/2 port (Connects IRQ12 from 8042 to IRQ12 on Am386SC300 Device)
Internal Video	Must leave open (pin 181 on Am386SC300 device functions as FRM in this mode)

Switches

SW3:	ON	OFF
1	nc	nc
2	Connects VGA_{RDY} to VL_{RDYI}	open
3	Connects VL_{RDY0} to VL_{RDYI}	open
4	nc	nc
SW4:	**ON**	**OFF**
1	Memory = 5V	Memory = 3.3V
2	Connects PIRQ1 to Am386SC300 Device	Disconnects PIRQ1 to Am386SC300 Device
3	Connects IRQ1 to Am386SC300 Device	Disconnects IRQ1 to Am386SC300 Device
4	BL1# = GND	BL1 = 5V
5	BL2# = GND	BL2 = 5V
6	BL3# = GND	BL3 = 5V
7	BL4# = GND	BL4 = 5V
8	AC_{IN} = GND	AC_{IN} = 5V

Power Measurement Jumpers

Be sure to turn off system power before removing JP1-11. Replace JP1-11 before power up or the system will not work.

Jumper	V_{CC}	Logic connected to V_{CC} plane
JP1	V_{CC}	Am386SC300 device core V_{CC} only. Always 3.3V
JP2	V_{CC3}	Am386SC300 device AV_{CC} pin. Analog V_{CC}. Always 3.3V
JP3	V_{CC5}	Am386SC300 device V_{CC5} pin. Diode clamp refs except V_{CCMEM} source pins. Always 5V except in full 3.3V designs. (Evaluation board limits to 5V)
JP4	V_{CCMEM}	Am386SC300 device memory interface V_{CC}. See SW4 table for 3.3V or 5V setting. Restrictions do apply. Also the diode clamp ref for pins attached to this V_{CCMEM} pin.
JP5	V_{CCSYS}	Am386SC300 device ISA bus V_{CC} and other misc pins. 5V or 3.3V. Refer to datasheet for details.
JP6	V_{CCSYS2}	Am386SC300 device alternate pin V_{CC}. 5V or 3.3V. Refer to datasheet for details.
JP7	$V_{CCMEM53}$	System DRAM V_{CC} plane.
JP8	V_{CCSRAM}	System SRAM V_{CC} plane.

JP10	V_{CCKBOS}	8042 V_{CC}
JP11	V_{CCROM}	BIOS and Application ROM V_{CC}
JP19	Vcc1	Am386SC300 Vcc1 pin 176. 5V or 3.3V

Appendix B: Verified Peripherals

This a list of peripherals that have been verified to work on the Am386SC300 Silicon Engine Evaluation Board:

Peripheral	Manufacturer	Model #
Floppy Drive	Mitsumi	D359T3
	TEAC	FD-235HF
Hard Drive	Quantum	ProDrive LPS series
	Western Digital	Caviar series
Power Supply	DTK Computer Inc	PIP-151
	TransWorld	TW-1800R
	Jabert	WE-D250
Keyboard	Keytronic	KT2000 series
	Mitsumi	KPQ-E99YC
VGA Monitor	CTX	6439
	NEC MultiSync	5FGE
CGA Monitor	IBM	5153
Video Card	AVED	AV540
	Trident	TVGA 9000I
PCMCIA	MiniStor Hard Disk	
	IBM Hard Disk	
	SunDisk ATA	
	Xircom Corporate Ethernet	
	TDK LAN X Ethernet	
	Intel FAX/Modems	
	Various SRAM cards	
LCD Panels	Sharp	LM32K10 - 320x240
		LM48014F - 480x320
	Epson	TCM-A0717 - 480x320
		TCM-A0709-1 - 480x320
	Casio	MD253TS01-00 - 640x200

Appendix C: Register Dump Utility

Introduction

This register dump utility has been provided for use on the Élan Am386SC300 Silicon Engine Evaluation Board. It is intended to provide a user with a easy to use register manipulation program. This program will display the index register in the Am386SC300 device, grouped by functionality:

- Élan PMU Registers Screen 1
- Élan PMU Registers Screen 2
- Élan PCMCIA Registers
- Élan MMU/ISA Registers

These registers can be read or written by simply entering a new value and pressing RETURN. Some registers do not allow full read/write access. Read-only registers will display the contents of the register but will not allow the user to write a new value. Write-only registers will allow a user to write a new value to the register. When a value is read from the register, it will display meaningless values. The following is a list of commands available in REGDUMP.EXE:

Arrow Keys Move the cursor from register to register within the screen.

s Toggles between the register screens.

v Allows user to enter a new value for the selected register.

b Switch the display to a bit by bit definition of the selected register

m Switch the display to an options menu screen

p Dumps all four registers screen to an asci text file title REGDUMP.LOG

q Exits from REGDUMP.EXE

The register value display is read from the registers each time the screen is toggled. Since the display is not updated with each write, it is possible that a register could appear to be written to, but if it is a read-only register, it will remain unchanged. Please refer to the programmers reference manual to determine if the register being manipulated has any read/write restrictions.

Appendix D: Memory Management System (MMS) Discovery Utility

Introduction

This document covers the purpose and use of MMSVIEW.EXE version 1.0. This utility is part of the collateral for the Am386SC300 Silicon Engine which will be referred to simply as "Élan" for the remainder of this document. Élan is a highly integrated device with many subsystems. Many of these subsystems are unique to Élan. The purpose of the MMSVIEW utility is to provide the new Élan user with the ability to explore the capabilities of Élan's MMS subsystem without having to invest much in the way of software development or chip register learning time.

Description

MMSVIEW is a DOS application that may be used to inspect various resources that are accessible by the Élan MMS subsystem. These resources include *SYSTEM RAM*, the *BIOS ROM* (or resources accessed by ROMCS# signal), the *DOS ROM* (or resources accessed by the DOSCS# signal), or the *PCMCIA* slots. With this utility, the following operations may be performed:

- Directly display any region of the system RAM (0-16mb range), BIOS ROM (0-16mb range), DOS ROM (0-16mb range), and PCMCIA (0-64mb range).
- Step forward or backward through the data in 256 byte steps or 16kb steps.
- Select to view PCMCIA common or attribute memory.
- Choose between viewing data from PCMCIA slot 1 or slot 2.
- Select any Élan MMS page from MMSA to view system resources through.
- Fill areas of PCMCIA SRAM card memory or system RAM memory with a selected byte.
- Append the currently displayed page of data to a log file in either ASCII or binary formats.
- View DOS ROM using 8 or 16 bit interface.
- Perform continuous read/compare operations from a selected resource, and indicate miscompares on the display.

Scope

MMSVIEW is provided to enable discovery and understanding of the capabilities of Élan's MMS system. It has other uses such as looking at the contents of PCMCIA card attribute memory to view CIS (Card Information Structure) or common memory to view card data, filling areas of system RAM and PCMCIA SRAM cards, and looking at DOS ROM disks to ensure that the odd/even parts are placed in the sockets correctly to name a few. It is not designed to be a comprehensive or automated diagnostic program, although its use may help in the debug of certain problems.

MMSVIEW uses MMSA only. To retain compatibility with systems using VGA video, MMSB was left outside the scope of this tool. It was designed on, tested on, and meant for use on the Élan Am386SC300 Silicon Engine Evaluation Board revision 2.1 or later. The fact that it may run on other customer platforms is purely coincidental.

IMPORTANT

No support of any kind will be provided for porting this utility to any platform other than the Élan evaluation board 2.1 or later except by special agreement between AMD and the customer.

Operating instructions

Command line parameters

MMSVIEW assumes that MMS page 4 (resides at D0000h when MMS page 0 is set up to reside at C0000h) is available for use. This default may be overridden using a command line parameter as shown below:

MMSVIEW [*page*]

where *page* is a number from 0-7 to indicate the initial MMS page to view the system resources through.
If an invalid command line parameter is detected (not a number, out of range, etc.) the default MMS page (4) will be used. This option is provided to allow resolution of system address space conflicts that may occur when using this program while some other driver is loaded (EMM386, etc.).

There are no other command line parameters available.

Initial state
After MMSVIEW has been invoked from the DOS command line, data is displayed in a fashion similar to DOS debug. MMSA page 4 at D0000h is selected, and the device that is accessed is system RAM. The first 256 bytes of the selected device is displayed starting at offset 0. In other words, the start of the interrupt vector table at 0:0 in RAM.

Keystroke commands
Keystroke commands are invoked by simply pressing the keys noted below. Whenever a keystroke command requires user input, prompts will request the required data. If a command that requires user input is to be aborted without invoking the command, press the escape key, and the main data display will return. A command summary follows:

? Pressing the question mark key from the main data display screen displays a quick help list of the keystroke commands available to the utility. Press the SPACE BAR from the quick help screen to return to the normal main display screen.

Space Bar The space bar (or any key besides the other command keys listed in this section) simply rereads the data from the selected resource, and refreshes the main data display screen. The main data screen does not constantly update normally. If, for example, you are viewing PCMCIA PC card Information Structure (CIS) data for one card, and you replace this card with another, the data printed on the screen does not automatically update. To view the data from the new card press the space bar (or any other non command key as specified in this list) to refresh the screen with the new data. For a continuous read mode, see the 'c' command below.

+ The plus key moves forward through the data 256 bytes at a time. The numeric keypad plus key thus makes it simple to view the next 100h bytes of data on the selected device.

- The minus key performs the inverse operation of the plus key, and causes the previous 256 bytes of device data to be displayed. The program disallows negative addresses, and gives a warning click from the speaker if you press the minus key when the first address displayed on the screen is 0.

a The 'a' key toggles between common and attribute memory for the current PCMCIA slot. When switching between slots using the 's' command, the state of the -REG line is remembered for each slot. This allows you to switch back and forth between the CIS of cards in slot A and slot B for comparison purposes.

c The 'c' key is useful for detecting changes in reading the data from a given resource. An example application for this feature is in the detection of timing problems (incorrect wait state setup, etc.) of PCMCIA cards, etc. When you press the 'c' key, a "snapshot" of the current device data is taken, and
stored into a local buffer. After this, continuous reads of the current device data are compared to the buffer. Miscompares cause the offending byte location to flash, and the result of an EXCLUSIVE OR between the buffer (snapshot) and the current device data is displayed. This allows bit errors to be picked out easily. Upon leaving continuous read/compare mode, the blink attribute is removed from the characters for easier reading of the resulting data. The bytes which have the bit miscompares are left highlighted in white (Vs. light gray for the normal data). Any new command which causes the data to be read from the device again removes the highlight attribute from the displayed data completely. If the highlight attribute needs to be removed without losing the bit error data which may have been captured, the 'r' command may be used (see below).

d The 'd' key selects which device the current MMS page points to. Pressing the 'd' key causes the system to prompt for the new device. Enter a number from 0 - 3 (0 = DOS ROM, 1 = system RAM, 2 = PCMCIA, 3 = BIOS ROM), and press enter. Invalid input will not be accepted. Once a new device has been entered, the main data display will return showing the data read from the selected device AT THE CURRENT OFFSET. In other words, if you are looking at the DOS ROM at offset 4000h, for example, and you use the 'd' command to select the BIOS ROM, the data displayed will be from offset 4000h of the BIOS ROM.

f The 'f' command allows a range of memory to be filled with a user selectable byte. Pressing the 'f' command brings up prompts for the start and stop fill addresses, and requests the fill byte. Fill operations are available only when PCMCIA or RAM is the selected device. This command does not know how to write to flash devices in a DOS ROM socket, or any PCMCIA card type other than SRAM.

g The 'g' command allows you to "go" to any place in the memory map desired. It is the random access equivalent to the plus and minus keys. It provides one additional benefit in that the data byte which resides at the address specified by the user to go to is highlighted for easy recognition.

I The 'I' key allows the DOS ROM interface to be toggled between the 8 and 16 bit interfaces supported on Élan. This is useful if running the utility on the Élan demo board, for example, which has an 8 bit DOS ROM interface as opposed to the 16 bit DOS ROM interface on the Élan evaluation board.

l The 'l' command allows one screen's worth of data to be appended to a log. Successive screens can be captured to the same file in this manner. Pressing the 'l' command prompts the user as to whether the output file should be a binary image of the data, or whether a DOS debug like ASCII representation should be saved. If the binary option is chosen, data will be logged to a file named MMSVIEW.BIN.
If the ASCII option is selected, the output file will be MMSVIEW.ASC.

n The 'n' command allows the user to select the use of a new MMS page (0-7). This can be useful in avoiding system conflicts. The default page can be changed before entering the program using the command line capability to set this option as described above.

p The 'p' command is essentially a 'g' command that accepts its input in terms of 16k pages. In other words, you can randomly access data on specific 16 kb boundaries using this command. For example, if you want to view the start of the first 16kb boundary of a device, select the p command, and input 0 when prompted to specify page 0. This can be done just as easily using the 'g' command and supplying an address that's a multiple of 4000h.

r The 'r' command resets the miscompare indicators as explained earlier in the section that explains the 'c' command. See the 'c' command description for more detail.
s The 's' command toggles between viewing data from PCMCIA slot 1 and slot 2. Each time the 's' command is pressed, the slot that is not currently being viewed becomes the active slot. This command only applies if the PCMCIA device is selected.

Page Up The page up key displays data on the previous 16k boundary. For example, if the current device data starting at offset 4100h is being displayed, and page up is pressed, the data from device offset 0100h will be displayed.

Page Down The page down key does the inverse of the page up key: it displays data from the NEXT 16k boundary.

Home key The home key displays the data at offset 0 on the current device.

Escape The escape key causes the utility to return control to the DOS prompt. Note that no clean up is done as the program exits, so it is recommended that the user COLD BOOT before performing any other important operations, especially if PCMCIA, ROMDOS, or EMM386 drivers were loaded on the system when MMSVIEW was invoked.

Restrictions on use

Although designed for the Élan evaluation board, this utility may work on other vendor's platforms. There are three key elements for compatibility. First, MMSVIEW assumes that MMSA is programmed to begin page 0 at C0000h. The starting location of MMSA is not reset by the utility in an attempt to maintain software compatibility with customer platforms as this would probably cause the customer's platform to crash. Use this utility on a customer platform only if customer platform initialization programs MMSA page 0 to start at C0000h.

The second element of compatibility is the use of the MMS windows on the customer platform. MMSVIEW assumes that MMS page 4 (resides at D0000h when MMS page 0 is set up to reside at C0000h) is available for use. This may conflict with drivers loaded on the evaluation board platform that require the use of MMS (ROMDOS, PCMCIA,EMM386 to name a few). It may also conflict with customer resources located on customer platforms. See the section above entitled *Operating Instructions* for details on how to change MMS windows

The third element of compatibility is not as major. MMSVIEW reprograms the IO locations of the REGA and REGB signals to reside at 108h and 10Ch respectively. These are the IO addresses that were set up in Phoenix's BIOS port to Élan. These IO locations are set up in this utility in case it is run on a vendor platform in order to achieve some level of software compatibility. When MMSVIEW exits, these locations can not be reprogrammed back to the initial values because these registers are write only. It is recommended that the test platform/evaluation system be "cold" booted (using reset button) after MMSVIEW exits so that Élan setup registers are restored to the proper values before doing further work on the platform. This is required not only on customer platforms, but on any Élan evaluation board that has any PCMCIA, ROMDOS, or EMM386 other drivers installed that require use of the MMS, or memory regions that are controlled by Élan's MMS. Again, MMSVIEW makes no attempt to restore the system to its initial state: RESET THE SYSTEM WHEN FINISHED.

Use caution when selecting the MMS page to use. Selecting a page that causes conflicts with other system resources can lock the system. For example, using a VGA card in the ISA slot of the evaluation board, and selecting pages 0 or 1 of MMSA will cause system conflicts since VGA BIOS decodes at C0000h for 32k bytes, and MMSA pages 0 and 1 also use that address space.

Refer to the Élan errata sheet regarding other MMS issues that may affect the way the system reacts to MMS accesses.

Appendix E: Serial and Parallel Port Setup Utility

EVALSET.EXE has been provided to allow easy activation of the serial and parallel ports on the Élan Am386SC300 Silicon Engine Evaluation Board. The BIOS on this board was designed to be generic, therefore these functions are not enabled by the BIOS on the evaluation board. This utility can be used to set up the base addresses for serial port 1, serial port 2 and parallel port 1 on the eval board.

Serial Port 1:

This is the 450 UART internal to the Am386SC300 device. Its base address can be set to either 0x3f8 or 0x2f8. The irq level can be set to either 3 or 4. If you enter a base address of 0, the internal UART is disabled. If you enter a valid base address but an irq of 0 then the UART is enabled but it will not be attached to an interrupt line.

Examples:
evalset ser1 0x3f8 4 (The settings for COM1:)
evalset ser1 0 0 (Disable the internal UART)

Note: Once the base address is set the UART will be programmed to 9600 baud, no parity, 8 data, 1 stop.

Serial Port 2:

This is connected to UART1 of the Super IO chip. Its base address can be set depending upon the IRQ level supplied. Note that for serial 2, it is not possible to disable just the IRQ level. If a base address of 0 is supplied, then serial port 2 is disabled.

Valid base addresses for IRQ 3 are 0x2f8, 0x2e8, 0x238, 0x2e0, 0x228.
Valid base addresses for IRQ 4 are 0x3f8, 0x2e8, 0x338, 0x2e8, 0x220.

Examples:
evalset ser2 0x2f8 3 (Settings for COM2:)
evalset ser2 0 0 (Disable the SIO uart).

Note: Once the base address is set, the UART will be programmed to 9600 baud, no parity, 8 data, 1 stop.

Parallel Port 1:

This is the internal parallel port on the Am386SC300 device. Its base address can be set to 0x3b8, 0x378, 0x278. Along with setting the base address, the mode of the parallel port can also be set for epp_mode and bidirectional mode.

Note: The parallel port base address is controlled through the internal video registers of the Am386SC300 device. If the internal video has been disabled to support an external video card, then the parallel port base address will not be changed. Because the registers are write only, this program does not have a way to verify that the base address has been changed.

Examples:
evalset par1 0x3b8 epp_on bi_on (turns on epp mode and bi-directional mode).
evalset par1 0x3b8 epp_off bi_off
evalset par1 0 epp_off bi_off

Usage

EVALSET.EXE can be called from the dos prompt, autoexec.bat or config.sys with the proper parameters.

Config.sys Example:

```
install=evalset.exe ser1 0x3f8 4
install=evalset.exe ser2 0x2f8 3
install=evalset.exe par1 0x3b8 epp_off bi_on
```